IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex Parte Hao et al.

Application for Patent

Filed: January 3, 2002

Application No.: 10/040,326

Group Art Unit 1763

Examiner Mulero, L. Alejandro

For:

LOWER ELECTRODE DESIGN FOR HIGHER UNIFORMITY

APPEAL BRIEF

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This is an appeal from the Final Rejection mailed April 19, 2006 rejecting all claims pending in the application including claims 22-23, 25, 27-32, 34-37, 39, 41-45, 47, 49, 51, 52, 54, 55, 60, 61, 63 and 65-68

1. REAL PARTY IN INTEREST

The real party in interest is the assignee, Lam Research Corporation of Fremont, California.

2. RELATED APPEALS AND INTERFERENCES

It is believed that there are no other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

3. STATUS OF CLAIMS

Claims 22-23, 25, 27-32, 34-37, 39, 41-45, 47, 49, 51, 52, 54, 55, 60, 61, 63 and 65-68 are all of the claims in the application and are the claims on appeal.

The claims on appeal are reproduced below in Appendix A: claims 22, 34, and 49 being independent claims.

4. STATUS OF AMENDMENTS

No amendment has been made to the claims since the Final Rejection.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present application is a continuation of parent application serial number 09/475,824, now U.S. Patent No. 6,363,882 with claims drawn to a plasma processing system. The claims of the present application are drawn to the pedestal for supporting a substrate during processing in the plasma processing system of the 6,363,822 patent.

The plasma processing system includes a plasma reactor 100 in accordance with one embodiment of the invention shown in Fig. 2 and described on page 6, line 28 to page 7, line 22.

The plasma reactor 100 generally includes a process chamber 102 within which a plasma 103 is both ignited and sustained for processing. Inside the chamber 102, there is generally disposed an upper electrode 104, which may be coupled to a first RF power supply 106 via a matching network (not shown to simplify the illustration). First RF power supply 106 is generally configured to supply upper electrode 104 with RF energy. A gas inlet 108 is provided within the upper electrode 104 for releasing gaseous source materials, e.g., the etchant source gases, into the active region between the upper electrode 104 and a substrate 110. The gaseous source materials may also be released from ports built into the walls of the chamber itself.

Substrate 110 is introduced into chamber 102 and disposed on a pedestal 112, which acts as a chuck and a lower electrode. The pedestal 112 is preferably biased by a second RF power supply 114 (also typically via a matching network) that is generally configured to supply pedestal 112 with RF energy.

In accordance with one aspect of the present invention and as shown in Fig. 3 and described on page 8, line 22, to page 11, line 27, a uniformity pedestal is provided that is capable of producing a high degree of processing uniformity across the surface of a substrate. In particular, the uniformity pedestal is configured to produce a uniform electric field. FIG. 3 illustrates a uniformity pedestal 130, according to one embodiment of the present invention. The uniformity pedestal 130 may respectively correspond to the pedestal 112 illustrated in FIG. 2.

The uniformity pedestal 130 generally includes an electrode 152, a chuck 154, an edge ring 156 and an impedance matching layer 158. The electrode 152 is configured for generating an electric field that is sufficiently strong to couple energy through the chuck 154, the edge ring 156, the impedance matching layer 158 and a substrate 160.

The edge ring 156 is disposed above the electrode and is arranged for shielding the electrode 152 and the chuck 154 from the plasma 103. In most embodiments, the edge ring 156 is configured to be a consumable part that is replaced

after excessive wear. In order to effectively shield the electrode 152 and the chuck 154, the edge ring 156 typically has a first portion 162 that surrounds the outer edge of the substrate 160 and a second portion 164 that surrounds the outer edge of the chuck 154. The second portion 164 is typically adjacent to the outer edge of the chuck 154 and disposed between the electrode 152 and the substrate 160.

The outer edge of the edge ring 156 is configured to extend to at least the outer edge of the electrode 152. In general, however, it is preferable to keep the length (measured across the bottom surface) of the edge ring 156 small to reduce the power needed to process the substrate 160.

The uniformity pedestal 130 also includes an impedance matching layer 158 that is disposed between the edge ring 156 and the electrode 152. The impedance matching layer 158 is preferably configured for controlling the impedance of the electric field produced by the electrode 152 across the surface of the substrate. More particularly, the impedance matching layer 158 is configured for altering the impedance of the electric field produced near the edge of the substrate 160.

As shown in FIG. 3, the impedance matching layer 158 is sandwiched between the edge ring 156 and the electrode 152.

Independent claims 22 and 34 are drawn to a pedestal and recite an electrode, a chuck, a substrate held by the chuck, an edge ring, and an impedance matching layer. Independent claim 49 drawn to a uniformity mechanism recites all of the elements except for the electrode. Following is a reading of specification and drawing on each of the claims 22, 34, and 49:

22. A pedestal (130, Fig. 3) for supporting a substrate (160) during plasma processing, said pedestal comprising:

an electrode (152) configured for generating an electric field; (page 8, line 28)

a chuck (154) disposed above said electrode (152) , said chuck being configured for holding said substrate (160); (page 8, line 28)

a generally planar edge ring (156) disposed above said electrode (152) and extending underneath a substrate (160) when positioned on said chuck (154), said edge ring (156) being formed from a dielectric material and configured for shielding said electrode (152) and said chuck (154) with inner edge portions proximate an edge

of said substrate (160) and an edge of said chuck (154) and an outer edge portion extending to one edge of said electrode (152); (page 8, line 29; page 10, line 3) and

an impedance matching layer (158) disposed and confined between said electrode (152) and said edge ring (156) and underneath said substrate (160) when said substrate (160) is resting on said pedestal (130), said impedance matching layer (158) being entirely planar and parallel with a top surface of the electrode (152) and a bottom surface of the edge ring (156), said impedance matching layer (158) being bonded to said electrode (152) or said edge ring (156), said impedance matching layer (158) having characteristics or features configured for controlling an impedance between said electrode (152) and a plasma (103, Fig. 2), said impedance being arranged to affect said electric field, wherein a first impedance produced through said chuck (154) is different than a second impedance produced through said edge ring (156), and wherein said impedance matching layer (158) is configured to alter said second impedance produced through said edge ring (156) so that said second impedance is substantially equal to said first impedance produced through said chuck (154), the equalization of said impedances improving processing uniformity across the surface of said substrate (160) by coupling energy more uniformly across the surface of the substrate (160) (page 10, line 32; page 11, line 17; page 11, line 21; page 12, line 17; page 12, line 25; page 13, line 25).

34. A pedestal (130, Fig. 3) for supporting a substrate (160) during plasma processing, said pedestal (130) comprising:

an electrode (152) for generating an electric field between a plasma (103, Fig. 2) and said electrode (152), said electrode (152) having an inner region and an outer region; (page 8, line 28)

a chuck (154) disposed above said inner region of said electrode (152), said chuck (154) being configured for holding said substrate (160) during processing, said chuck (154) affecting a first impedance between said electrode (152) and said plasma (103, Fig. 2) in an area above said inner region of said electrode (152); (page 8, line 29; page 10, line 3)

an edge ring (156) disposed above said outer region of said electrode (152) and positioned next to a side of said chuck (154), said edge ring (156) being

configured for shielding at least said electrode (152) from said plasma (103, Fig. 2) with inner edge portions proximate an edge of said substrate (160) and an edge of said chuck (154) and an outer edge portion extending to one edge of said electrode (152), said edge ring (156) affecting a second impedance between said electrode (152) and said plasma (103, Fig. 2) in an area above said outer region of said electrode (152);

an impedance matching layer (158) disposed and confined between said edge ring (156) and said electrode (152) and above said outer region of said electrode (152), said impedance matching layer (158) having characteristics configured to adjust said second impedance so as to improve processing uniformity across the surface of said substrate (160), said impedance matching layer (158) being configured to match the impedance between said electrode (152) and said plasma (103, Fig. 2) at the edge of said substrate (160) with the impedance between said electrode (152) and said plasma (103, Fig.2) at the center of said substrate(160) (page 10, line 32; page 11, line 17; page 10, line 21; page 12, line 17; page 12, line 25).

49. A uniformity mechanism (Fig. 3) suitable for use in a process chamber (102, Fig. 2) within which a plasma (103, Fig. 2) is ignited and sustained for processing a substrate (160), the uniformity mechanism comprising:

a first component including a chuck (154) disposed underneath an inner region of the substrate (160) when the substrate (160) is positioned inside the process chamber (102, Fig. 2) for processing, the first component producing a first impedance when energy is coupled therethrough; (page 8, line 28)

a second component including a planar edge ring (156) disposed underneath an outer region of the substrate (160) when the substrate (160) is positioned inside the process chamber (102, Fig. 2) for processing, and extending underneath a substrate (160) when positioned on said chuck (154) the second component producing a second impedance when energy is coupled therethrough, the first impedance being different than the second impedance; and

an impedance matching layer (158) disposed and confined under said edge ring (156) and having characteristics configured to adjust the second impedance such that the second impedance is substantially equal to the first impedance, said characteristics including at least one of a thickness, a length, a position, or a material property, at least a portion of the impedance matching layer (158) being disposed

underneath the substrate (160) when the substrate (160) is positioned inside the process chamber (102, Fig. 2) for processing (page 10, line 32; page 15, lines 10-14).

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Independent claims 22 and 49 and all claims depending therefrom have been finally rejected under 35 USC 112, first and second paragraphs, the Examiner questioning whether the claims recite an edge ring or a substrate positioned on the chuck.

Independent claims 22 and 49 have been finally rejected under 35 USC 102(b) as being fully met by Masuda et al. U.S. Patent No. 6,171,438 and by Wicker et al. U.S. Patent No. 6,129,808.

Independent claims 22, 34, and 49 have been finally rejected under 35 USC 103(a) as being obvious from Tamura U.S. Patent No. 5,792,304 in view of Ohmi et al. WO 98/39500 (U.S. Patent 6,585,851).

Claim 34 has been finally rejected under 35 USC 103(a) as unpatentable over Masuda et al.

Claim 34 has been finally rejected under 35 USC 103(a) as unpatentable over Wicker et al.

Dependent claims have been finally rejected on other combinations of the cited references, but for purposes of this Appeal only the rejections of independent claims 23, 34 and 49 need be considered. Patentability of these claims necessarily lends patentability for all claims depending therefrom.

7. ARGUMENT

As noted above, independent claims 22 and 34 are drawn to a pedestal for use in the plasma processing system of the parent application, now U.S. Patent No. 6,262822.

Independent claims 22 and 34 specifically recite the cooperative structure and relationship of the electrode, chuck, substrate held by the chuck, edge ring, and

impedance matching layer. Independent claim 49 drawn to a uniformity mechanism recites all of the elements except for the electrode.

<u>CLAIMS 22 AND 49 ARE IN COMPLIANCE WITH 35 USC 112, 1st AND 2nd PARAGRAPHS</u>

Claim 22 specifies, in part, a pedestal for supporting a substrate during plasma processing and comprising:

> an electrode configured for generating an electric field;
>
> a chuck disposed above said electrode, said chuck being configured for holding said substrate;
>
> a generally planar edge ring disposed above said electrode and extending underneath a substrate when positioned on said chuck,

Contrary to the allegation of indefiniteness by the Examiner, it is believed that the claim is definite in specifying a chuck configured for holding a substrate, and a generally planar edge ring extending underneath a substrate when positioned on the chuck. It is believed that the claim is definite in specifying, when read in context, that the substrate is positioned on the chuck and not the planar edge ring as contended by the Examiner. The same language can be found in claim 49, and it is believed that claim 49 is in compliance with 35 USC 112 also.

However, if necessary, the Examiner's objection can readily be addressed by inserting after "when" the words --the substrate is--. The claims would then recite:

> a generally planar edge ring disposed above said electrode and extending underneath a substrate **when the substrate** is positioned on said chuck,

<u>THE CITED REFERENCES, SINGLY OR COMBINED, DO NOT SHOW OR SUGGEST THE PEDESTAL OF CLAIMS 22 AND 34 OR THE UNIFORMITY MECHANISM OF CLAIM 49</u>

None of the references, singly or in combination, shows or suggests the recited planar edge ring extending underneath a substrate when positioned on the chuck with inner edge portions proximate an edge of the substrate and an edge of the

chuck and an outer edge portion extending to one edge of the electrode; and an impedance matching layer disposed and confined between the electrode and the edge ring and underneath the substrate when the substrate is resting on the pedestal, the impedance matching layer being entirely planar and parallel with a top surface of the electrode and a bottom surface of the edge ring (claim 22). Claims 34 and 49 include similar recitations for the edge ring and for the impedance matching layer.

CLAIMS 22 AND 49 ARE PATENTABLE OVER MASUDA ET AL. UNDER 35 USC 102(b)

Masuda et al. 6,171,438 discloses in Fig. 2 a chuck 131 for holding a wafer W, with a sample holder ring 133 over an insulator 132, with a heat transfer gas provided in a chamber 136a between the ring and insulator. Note that the numerals 132 and 133 are reversed in Fig. 1.

Insulator 132 is not confined between the electrode and edge ring and underneath the substrate when the substrate is resting on the pedestal, with the impedance matching layer being entirely planar and parallel with a top surface of the electrode and a bottom surface of the edge ring; rather, insulator 132 in Fig. 2 is recessed to define the cavity 136a for transfer gas. Moreover, insulation 133 envelopes the electrostatic chucking device 131 and is not confined between the electrode and the edge ring as claimed.

CLAIMS 22 AND 49 ARE PATENTABLE OVER WICKER ET AL. UNDER 35 USC 102(b)

Wicker et al. 6,129,808 discloses a plasma etch chamber including a pedestal 112 enveloping a chuck 106 in which a substrate 104 is mounted and with a focus ring 114 mounted on the chuck and around substrate 104. The Examiner refers to pedestal 112 as an impedance matching layer; however, pedestal 112 envelopes chuck 106 and electrode 108 and is not confined between the electrode and the edge ring underneath the substrate as defined by the claims. In this respect, Wicker is similar to the Masuda et al. structure in which the insulator 132 envelopes the chuck and is not confined between the electrode and edge ring. The claimed impedance matching layer and the insulator of Wicker are different in structure and in function in their respective plasma etchers.

CLAIMS 22, 34 AND 49 ARE PATENTABLE OVER TAMURA ET AL. IN VIEW OF OHMI ET AL. UNDER 35 USC 103(a)

Tamura et al. 5,792,304 discloses a substrate holding system and as shown in fig. 9 a substrate 1 is held by a chuck above electrode 2 with a susceptor cover 36 for holding member 2, (column 15, lines 1-9). Clearly, susceptor 36 is not a generally planar edge ring disposed above the electrode, but rather is a cover for the dielectric material and holding member 2 and functions to "uniform the gas flow for substrate etching to be uniform". Further, the Examiner recognizes that Tamura et al. do not disclose the recited impedance matching layer between the electrode and edge ring, the Examiner referring to the cited Ohmi et al. as including an impedance matching layer. However, there is no suggestion in Tamura et al. for including an impedance matching layer with their electrically insulating cover 36, and the use of an insulator by Ohmi et al. with their electrode 103 would not appear to be useful in the cover 36 of Tamura et al. In any event, the pedestal as now claimed would not result therefrom assuming arguendo that Tamura and Ohmi could be combined.

Ohmi et al. WO98/39500 (U.S. Patent No. 6,585,851) discloses a plasma etching device including in Fig. 1 a local electrode 103 which the Examiner construes to be an edge ring, however it is noted that the electrode 103 does not extend underneath the substrate 108 positioned on a base of electrode 101, nor does electrode 103 proximately abut an edge of the substrate and an edge of the chuck as claimed. It is clear that Ohmi does not provide the protection for the chuck and electrode as does the claimed pedestal. Note that electrode 103 is positioned on impedance matching layer 104 which does not extend underneath the substrate when the substrate is resting on the pedestal 101a.

CLAIM 34 IS PATENTABLE OVER MASUDA ET AL. UNDER 35 USC 103(a)

Claim 34 is identical to claim 22 in defining the edge ring and the impedance matching layer of the claimed pedestal. As noted above with respect to claim 22, Masuda et al. do not disclose or suggest the edge ring extending under a substrate or an impedance matching layer disposed and confined between the electrode and edge ring and underneath the substrate.

CLAIM 34 IS PATENTABLE OVER WICKER ET AL. UNDER 35 USC 103(a)

Again, claim 34 is identical to claim 22 in defining the edge ring and the impedance matching layer of the claimed pedestal. As noted above, Wicker et al. pedestal 112, which the Examiner refers to as an impedance matching layer, envelopes chuck 106 and electrode 108 and is not confined between the electrode 108 and edge ring underneath the substrate as defined by claim 34.

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Dependent claims have been rejected under 35 USC 103(a) on various combinations of the cited prior art, but for purposes of this appeal these rejections are not addressed since the parent independent claims are believed to patentably distinguish the references, as noted above.

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8. CONCLUSION

It is respectfully submitted that independent claims 22 and 49 are not fully met by Masuda et al or Wicker et al. as alleged by the Examiner. It is respectfully submitted that independent claims 22, 34, and 49 are not obvious from Tamura taken with Ohmi as alleged by the Examiner. It is respectfully believed that claim 34 is not obvious from either Masuda or from Wicker, as alleged by the Examiner.

It is respectfully requested that the Final Rejections of independent claims 22, 34 and 49 be reversed along with the Final Rejection of all claims depending therefrom.

Respectfully submitted,
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9. CLAIMS APPENDIX

CLAIMS ON APPEAL

22. A pedestal for supporting a substrate during plasma processing, said pedestal comprising:

an electrode configured for generating an electric field;

a chuck disposed above said electrode, said chuck being configured for holding said substrate;

a generally planar edge ring disposed above said electrode and extending underneath a substrate when positioned on said chuck, said edge ring being formed from a dielectric material and configured for shielding said electrode and said chuck with inner edge portions proximate an edge of said substrate and an edge of said chuck and an outer edge portion extending to one edge of said electrode; and

an impedance matching layer disposed and confined between said electrode and said edge ring and underneath said substrate when said substrate is resting on said pedestal, said impedance matching layer being entirely planar and parallel with a top surface of the electrode and a bottom surface of the edge ring, said impedance matching layer being bonded to said electrode or said edge ring, said impedance matching layer having characteristics or features configured for controlling an impedance between said electrode and a plasma, said impedance being arranged to affect said electric field, wherein a first impedance produced through said chuck is different than a second impedance produced through said edge ring, and wherein said impedance matching layer is configured to alter said second impedance produced through said edge ring so that said second impedance is substantially equal to said first impedance produced through said chuck, the equalization of said impedances improving processing uniformity across the surface of said substrate by coupling energy more uniformly across the surface of the substrate.

23. The pedestal as recited in claim 22 wherein said impedance is configured to reduce variations in said electric field.

25. The pedestal as recited in claim 22 wherein said impedance matching layer is arranged to control said impedance between said electrode and said plasma at the edge of said substrate.

27. The pedestal as recited in claim 22 wherein said impedance matching layer is configured to be disposed between said electrode and said substrate when said substrate is held by said chuck.

28. The pedestal as recited in claim 22 wherein said first portion cooperates with said chuck to define an area for receiving a bottom surface of said substrate.

29. The pedestal as recited in claim 22 wherein said edge ring has a second portion extending above said first portion, said first portion being configured to surround an outer edge of said chuck, said second portion being configured to surround an outer edge of said substrate when said substrate is held by said chuck for processing whereby said edge ring cooperates with said chuck to form a recessed portion for accepting said substrate for processing.

30. The pedestal as recited in claim 22 wherein said chuck has an outer periphery that is smaller than an outer periphery of said substrate.

31. The pedestal as recited in claim 22 wherein said impedance matching layer is formed from a dielectric material.

32. The pedestal as recited in claim 22 wherein said chuck, edge ring and impedance matching layer are formed from a dielectric material, wherein the dielectric constant of said edge ring is equal to the dielectric constant of said chuck, and wherein the dielectric constant of said impedance matching layer is different than the dielectric constant of said edge ring and said chuck.

34. A pedestal for supporting a substrate during plasma processing, said pedestal comprising:

an electrode for generating an electric field between a plasma and said electrode, said electrode having an inner region and an outer region;

a chuck disposed above said inner region of said electrode, said chuck being configured for holding said substrate during processing, said chuck affecting a first impedance between said electrode and said plasma in an area above said inner region of said electrode;

an edge ring disposed above said outer region of said electrode and positioned next to a side of said chuck, said edge ring being configured for shielding at least said electrode from said plasma with inner edge portions proximate an edge of said substrate and an edge of said chuck and an outer edge portion extending to one edge of said electrode, said edge ring affecting a second impedance between said electrode and said plasma in an area above said outer region of said electrode;

an impedance matching layer disposed and confined between said edge ring and said electrode and above said outer region of said electrode, said impedance matching layer having characteristics configured to adjust said second impedance so as to improve processing uniformity across the surface of said substrate, said impedance matching layer being configured to match the impedance between said electrode and said plasma at the edge of said substrate with the impedance between said electrode and said plasma at the center of said substrate.

35. The pedestal as recited in claim 34 wherein said chuck is an electrostatic chuck.

36. The pedestal as recited in claim 34 wherein said impedance matching layer is bonded to said edge ring.

37. The pedestal as recited in claim 34 wherein said impedance matching layer is bonded to said electrode.

38. (withdrawn) The pedestal as recited in claim 34 wherein the length and position of said impedance matching layer with respect to said edge ring is adjusted to control said second impedance.

39. The pedestal as recited in claim 34 wherein the impedance matching layer is formed from a material with a dielectric constant, wherein said dielectric constant is adjusted to control said second impedance.

40. (withdrawn) The pedestal as recited in claim 34 wherein the thickness of said impedance matching layer is adjusted to control said second impedance.

41. The pedestal as recited in claim 34 wherein said electrode has an outer periphery that is greater than or equal to the outer periphery of said substrate when said substrate is disposed on said chuck for processing.

42. The pedestal as recited in claim 34 wherein said electric field produces a uniform sheath voltage at the surface of said substrate when said substrate is disposed on said chuck for processing.

43. The pedestal as recited in claim 34 wherein said electrode is coupled to an RF power source configured to supply RF energy to said electrode.

44. The pedestal as recited in claim 34 further comprising a heat transfer system for controlling the temperature of said substrate and said edge ring during processing, said heat transfer system including a first channel extending through said electrode to the interface between said chuck and said substrate, and a second channel extending through said electrode to the interface between said electrode and said edge ring, said heat transfer system being configured to provide a heat transfer medium through said channels.

45. The pedestal as recited in claim 44 wherein said heat transfer medium is a helium gas.

47. The pedestal as recited in claim 34 wherein said inner region of said electrode corresponds to an inner portion of said substrate when said substrate is disposed over said chuck for processing, and wherein said outer region of said electrode corresponds to an outer portion of said substrate when said substrate is disposed over said chuck for processing.

49. A uniformity mechanism suitable for use in a process chamber within which a plasma is ignited and sustained for processing a substrate, the uniformity mechanism comprising:

a first component including a chuck disposed underneath an inner region of the substrate when the substrate is positioned inside the process chamber for processing, the first component producing a first impedance when energy is coupled therethrough;

a second component including a planar edge ring disposed underneath an outer region of the substrate when the substrate is positioned inside the process chamber for processing, and extending underneath a substrate when positioned on said chuck the second component producing a second impedance when energy is coupled therethrough, the first impedance being different than the second impedance; and

an impedance matching layer disposed and confined under said edge ring and having characteristics configured to adjust the second impedance such that the second impedance is substantially equal to the first impedance, said characteristics including at least one of a thickness, a length, a position, or a material property, at least a portion of the impedance matching layer being disposed underneath the substrate when the substrate is positioned inside the process chamber for processing.

51. The uniformity mechanism as recited in claim 49 wherein the impedance matching layer is disposed below said second component.

52. The uniformity mechanism as recited in claim 49 wherein the uniformity mechanism is configured for supporting the substrate during processing.

54. The uniformity mechanism as recited in claim 49 further including a third component for generating an electric field.

55. The uniformity mechanism as recited in claim 49 wherein the first and second components are disposed above an electrode.

60. The pedestal as recited in claim 22 wherein the electrode is formed from a conductive material, and wherein the chuck, the edge ring and the impedance matching layer are formed from a dielectric material.

61. The pedestal as recited in claim 60 wherein the dielectric constant of said edge ring is equal to the dielectric constant of said chuck, and wherein the dielectric constant of said impedance matching layer is larger than the dielectric constant of said edge ring and said chuck in order to compensate for increased impedance that exists at the edge of the chuck.

62. (withdrawn) The pedestal as recited in claim 22 wherein the electrode is formed from a conductive material, the chuck and the edge ring are formed from a dielectric material, and the impedance matching layer is formed from a semi-conductive or conductive material.

63. The pedestal as recited in claim 22 wherein the impedance matching layer is formed from silicon, silicon oxide, silicon nitride, silicon carbide, quartz, aluminum, anodized aluminum or aluminum oxide.

65. The pedestal as recited in claim 22 wherein the impedance matching layer is disposed between the edge ring and the electrode only in the region of the substrate.

66. The pedestal as recited in claim 22 wherein the top surface of the electrode is configured to be substantially uniform and substantially parallel to the substrate so as to provide an even distribution of energy.

67. The pedestal as recited in claim 34 wherein the impedance matching layer is bonded to the edge ring or the electrode via a silicon elastomer and wherein the edge ring is formed from a dielectric material and is electrically floating or electrically coupled to a DC ground.

68. The pedestal as recited in claim 44 wherein the impedance matching layer is bonded to a backside of the edge ring, and wherein the first channel is configured to distribute the heat transfer medium to a first gap located between the chuck and the

backside of the substrate, and wherein the second channel is configured to distribute the heat transfer medium to a second gap located between the electrode and the backside of the edge ring that includes the impedance matching layer.

10. EVIDENCE APPENDIX

None

11. RELATED PROCEEDINGS APPENDIX

None